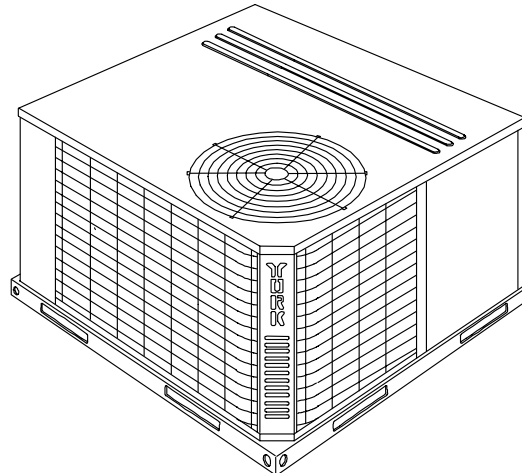


### MODELS B1HP024 THRU 048 2 THRU 4 TON (13 SEER)



#### GENERAL

YORK Model B1HP units are factory assembled heat pumps designed for outdoor installation on a roof top or a slab. Field-installed electric heater accessories are available to provide supplemental electric heat combined with electric cooling and heating.

The units are completely assembled on rigid, removable base rails. All piping, refrigerant charge, and electrical wiring is factory installed and tested. The units require only electric power and duct connections at the point of installation.

The electric heaters have nickel-chrome resistance wire elements and utilize single point power connection.

#### INSPECTION

As soon as a unit is received, it should be inspected for possible damage during transit. If damage is evident, the extent of the damage should be noted on the carrier's freight bill. A separate request for inspection by the carrier's agent should be made in writing. Refer to Form 50.15-NM for additional information.

#### REFERENCE

Additional information on the design, installation, operation and service of this equipment is available in the following reference forms:

- 55.70-N1 — General Installation
- 55.70-N2 — Pre-start & Post-start Check List
- 035-16605-001 — Electric Heater Accessory

#### REPLACEMENT PARTS

- Refer to User's Maintenance and Service Information Manual for complete listing of replacement parts on this equipment.

All forms referenced in this instruction may be ordered from:

**Standard Register**  
Norman, Oklahoma 73069  
Toll Free: Tel. 877-318-9675/Fax. 877-379-7920

Installer should pay particular attention to the words: **NOTE**, **CAUTION** and **WARNING**. **Notes** are intended to clarify or make the installation easier. **Cautions** are given to prevent equipment damage. **Warnings** are given to alert installer that personal injury and/or equipment damage may result if installation procedure is not handled properly.

#### CAUTION

THIS PRODUCT MUST BE INSTALLED IN STRICT COMPLIANCE WITH THE ENCLOSED INSTALLATION INSTRUCTIONS AND ANY APPLICABLE LOCAL, STATE, AND NATIONAL CODES INCLUDING, BUT NOT LIMITED TO, BUILDING, ELECTRICAL, AND MECHANICAL CODES

#### WARNING

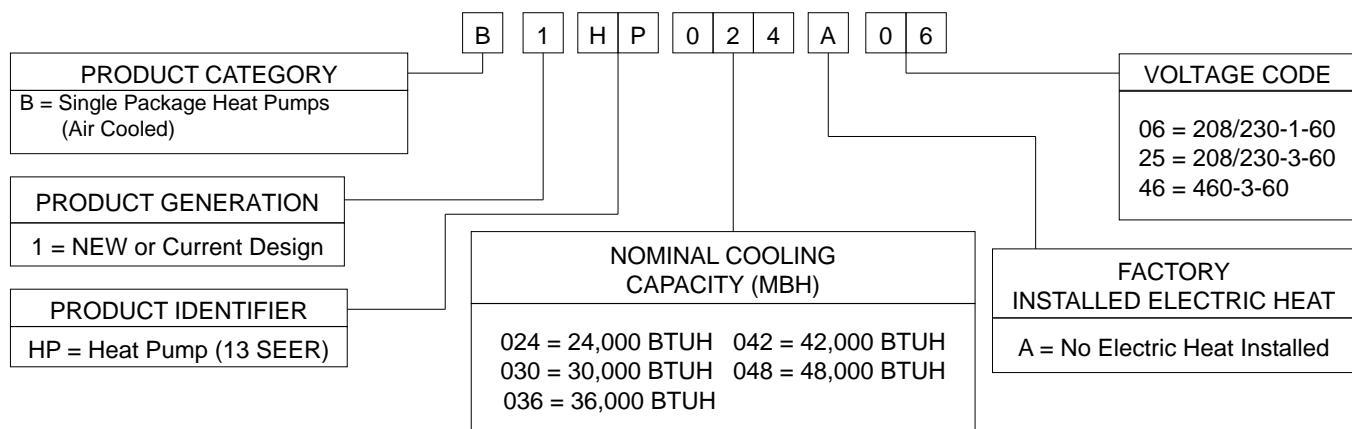
INCORRECT INSTALLATION MAY CREATE A CONDITION WHERE THE OPERATION OF THE PRODUCT COULD CAUSE PERSONAL INJURY, PROPERTY DAMAGE AND/OR DEATH.

#### WARNING

DE-ENERGIZE THE ELECTRICAL POWER TO THE UNIT BEFORE ATTEMPTING TO INSPECT, REPAIR OR PERFORM MAINTENANCE TO THE UNIT.

## PRODUCT NOMENCLATURE

035-19392-000-A-0303



## INSTALLATION

### LIMITATIONS

These units must be installed in accordance with the following national and local safety codes.

1. National Electrical Code ANSI/NFPA No. 70 or Canadian Electrical Code Part 1, C22.1 (latest editions).
2. Local plumbing and waste water codes and other applicable local codes.

Refer to Table 1 for unit application data and to Table 5 for electric heat application data.

If components are to be added to a unit to meet local codes, they are to be installed at the dealer's and/or the customer's expense.

Size of unit for proposed installation should be based on heat loss/heat gain calculations made in accordance with industry recognized procedures identified by the Air Conditioning Contractors of America.

### LOCATION

**TABLE 1 - UNIT APPLICATION DATA**

Voltage Variation Min. / Max. <sup>1</sup>	208/230V <sup>3</sup> 460V	187 / 253 <sup>3</sup> 414 / 504
Wet Bulb Temperature (°F) of Air on Evaporator Coil, Min. / Max.	57 / 72	
Dry Bulb Temperature (°F) of Air on Condenser Coil, Min. <sup>2</sup> / Max.	45 / 120	

<sup>1</sup> Rated in accordance with ARI Standard 110, utilization range "A".

<sup>2</sup> A low ambient accessory is available for operation down to 0°F

<sup>3</sup> "T1" transformer primary tap must be moved from the 230 volt connection to the 208 volt connection for low voltage applications of 208 volt and below.

Use the following guidelines to select a suitable location for these units.

1. Unit is designed for outdoor installation only.
2. Condenser must have an unlimited supply of air. Where a choice of location is possible, position unit on either north or east side of building.
3. For ground level installation, a level pad or slab should be used. The thickness and size of the pad or slab used should meet local codes and unit weight. Do not tie the slab to the building foundation.
4. For roof top installation, be sure the structure can support the weight of the unit plus any field installed components. Unit must be installed on a level roof curb or appropriate an-

gle iron frame providing adequate support under the compressor/condenser section.

5. Maintain level tolerance of unit to 1/8" maximum.

### RIGGING OR HANDLING

Care must be exercised when moving the unit. Do not remove any packaging until the unit is near the place of installation. Rig unit with slings placed under the unit. Spreader bars of sufficient length should be used across the top of the unit.

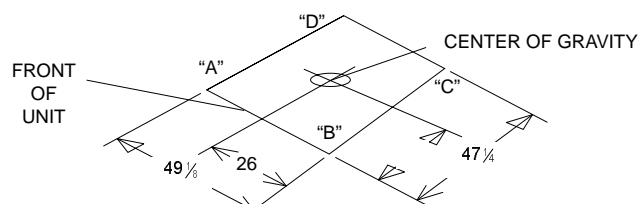
BEFORE LIFTING A UNIT, MAKE SURE THAT ITS WEIGHT IS DISTRIBUTED EQUALLY ON THE CABLES SO THAT IT WILL LIFT EVENLY.

Units may also be moved or lifted with a fork-lift. Slotted openings in the skid are provided for this purpose. Forks must pass completely through the base.

Refer to Table 2 for unit weights and to Figure 1 for approximate center of gravity.

**TABLE 2 - UNITS WEIGHTS**

UNIT SIZE	SHIPPING WEIGHT (lbs.)	OPERATING WEIGHT (lbs.)	CORNER WEIGHTS (location, lbs.)			
			"A"	"B"	"C"	"D"
024	356	351	97	93	81	84
030	353	348	96	93	81	84
036	388	383	106	102	89	92
042	440	435	120	115	101	104
048	485	480	132	127	111	115



**FIG. 1 - CENTER OF GRAVITY**

## CLEARANCES

All units require certain clearances for proper operation and service. Refer to Figures 3 & 4 for the clearances required for construction, servicing and proper unit operation.

**WARNING:** *Do not permit overhanging structures or shrubs to obstruct the condenser air discharge outlet.*

## DUCT WORK

These units are adaptable to downflow use as well as rear supply and return air duct openings. To convert to downflow, use the following steps:

1. Remove the duct covers found in the bottom return and supply air duct openings. There are four (4) screws securing each duct cover (save these screws to use later).
2. Install the duct covers, removed in step one, to the rear supply and return air duct openings. Secure with the four (4) screws used in step one.
3. Seal duct covers with silicone caulk.

Downflow units must have an "L"-shaped supply duct without any outlets or registers located below the outlet of the unit.

Duct work should be designed and sized according to the methods of the Air Conditioning Contractors of America (ACCA), as set forth in their Manual D.

A closed return duct system shall be used. This shall not preclude use of economizers or ventilation air intake. Flexible joints may be used in the supply and return duct work to minimize the transmission of noise.

**CAUTION:** *When fastening duct work to the side duct flanges on the unit, insert the screws through the duct flanges only. DO NOT insert the screws through the casing. Outdoor duct work must be insulated and waterproofed.*

**NOTE:** *Be sure to note supply and return openings.*

Refer to Figure 4 for information concerning rear and bottom supply and return air duct openings.

## FILTERS

Single phase units are shipped without a filter and is the responsibility of the installer to secure a filter **in the return air ductwork or install a Filter/Frame Kit (1FF0114).**

A filter rack and a high velocity filters are standard on three phase units.

Filters must always be used and must be kept clean. When filters become dirt laden, insufficient air is delivered by the blower, decreasing your unit's efficiency and increasing operating costs and wear-and-tear on the unit and controls.

Filters should be checked monthly especially since this unit is used for both heating and cooling.

## CONDENSATE DRAIN

A condensate trap is required to be installed in the condensate drain. The plumbing must conform to local codes. Use a sealing compound on male pipe threads. Install the condensate drain line ( $\frac{3}{4}$ " NPTF) to spill into an open drain.

## SERVICE ACCESS

Access to all serviceable components is provided by the following removable panels:

- Blower service access
- Electrical/Filter access
- Compressor service access

Refer to Figures 3 & 4 for location of these access panels and minimum clearances.

## THERMOSTAT

The room thermostat should be located on an inside wall approximately 56" above the floor where it will not be subject to drafts, sun exposure or heat from electrical fixtures or appliances. Follow manufacturer's instructions enclosed with the thermostat for general installation procedure. Six color coded insulated wires (minimum #18 AWG) should be used to connect thermostat to unit. See Figure 2.

## POWER AND CONTROL WIRING

Field wiring to the unit must conform to provisions of the current N.E.C. ANSI/NFPA No. 70 or C.E.C. and/or local ordinances. The unit must be electrically grounded in accordance with local codes or, in their absence, with the N.E.C./C.E.C. Voltage tolerances which must be maintained at the compressor terminals during starting and running conditions are indicated on the unit Rating Plate and Table 3.

The wiring entering the cabinet must be provided with mechanical strain relief.

A fused disconnect switch should be field provided for the unit. If any of the wire supplied with the unit must be replaced, replacement wire must be of the type shown on the wiring diagram.

Electrical line must be sized properly to carry the load. Each unit must be wired with a separate branch circuit fed directly from the meter panel and properly fused.

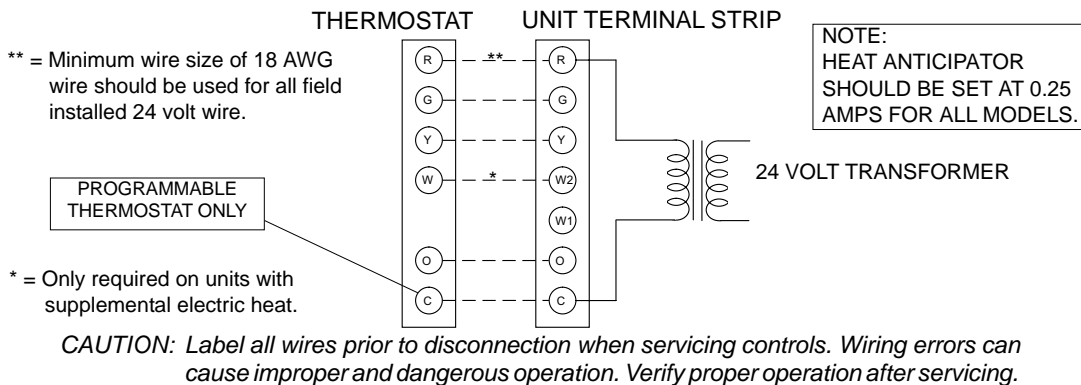
Refer to Figure 2 for typical field wiring and to the appropriate unit wiring diagram for control circuit and power wiring information.

## COMPRESSORS

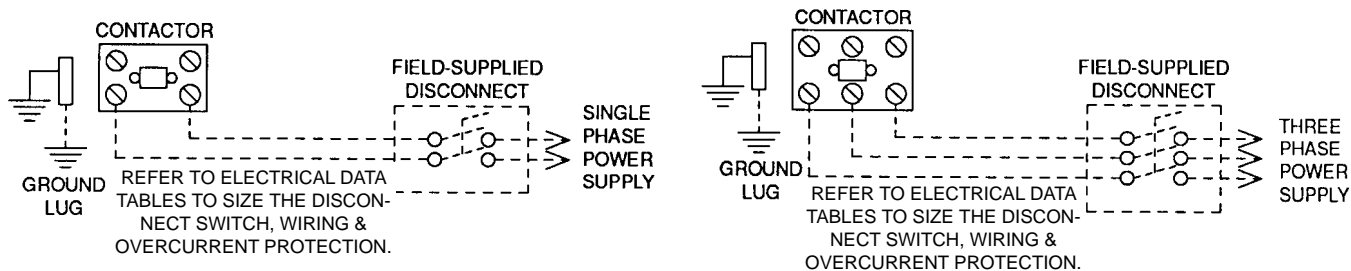
Units are shipped with compressor mountings factory-adjusted and ready for operation.

**CAUTION:** *Do Not loosen compressor mounting bolts.*

# CONTROL WIRING



# POWER WIRING



**FIG. 2 - TYPICAL FIELD WIRING DIAGRAM**

**TABLE 3 - PHYSICAL DATA**

MODELS		BHP				
		024	030	036	042	048
INDOOR BLOWER	CENTRIFUGAL BLOWER (Dia. x Wd. in.)	10 X 8	10 X 8	11 x 10	11 x 10	11 x 10
	FAN MOTOR HP (ECM)	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$
INDOOR COIL	ROWS DEEP	2	3	3	3	3
	FINS PER INCH	15	13	15	16	16
	FACE AREA (Sq. Ft.)	4.38	4.38	4.38	5.63	5.63
OUTDOOR FAN	PROPELLER DIA. (in.)	22	22	22	22	22
	FAN MOTOR HP	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$
	NOM. CFM TOTAL	1,800	1,800	2,400	2,400	3,000
OUTDOOR COIL	ROWS DEEP	1	1	2	2	2
	FINS PER INCH	20	20	20	20	20
	FACE AREA (Sq. Ft.)	11.7	11.7	11.7	16.4	16.4
CHARGE	REFRIGERANT 22 (lbs./oz.)	5 / 5	5 / 15	8 / 4	9 / 14	12 / 0
FILTER	FACE AREA (Sq. Ft. / Qty. / Size)	4.28 / 2 / 14" x 22"				
COMPRESSOR	HERMETIC Type, (Qty. = 1)	Reciprocating	Scroll	Scroll	Scroll	Scroll

**TABLE 4 - ELECTRICAL DATA (BASIC UNIT)**

MODEL BHP	POWER SUPPLY	VOLTAGE LIMITATIONS <sup>1</sup>		COMPRESSOR		OUTDOOR FAN MOTOR, FLA	SUPPLY AIR BLOWER MOTOR, FLA	MINIMUM CIRCUIT AMPACITY	MAX. FUSE SIZE, <sup>1</sup> AMPS <sup>2</sup>	MAX. HACR BREAKER SIZE, AMPS	UNIT POWER FACTOR	TRANSFORMER SIZE (VA)
		MIN.	MAX.	RLA	LRA							
024	208/230-1-60	187	253	9.3	57.0	1.1	5.0	17.7	25	25	0.96	40
030	208/230-1-60	187	253	15.0	72.5	1.1	5.0	24.9	35	35	0.96	40
	208/230-3-60	187	253	10.0	63.0	1.1	5.0	18.6	25	25	0.96	75
	460-3-60	414	504	5.0	31.0	0.6	5.0	11.9	15	15	0.96	75
036	208/230-1-60	187	253	17.2	94.0	1.1	7.3	29.9	45	45	0.96	40
	208/230-3-60	187	253	11.4	78.0	1.1	7.3	22.7	30	30	0.96	75
	460-3-60	414	504	5.7	40.0	0.6	7.3	15.4	20	20	0.96	75
042	208/230-1-60	187	253	20.0	104.0	1.1	7.3	33.4	50	50	0.96	40
	208/230-3-60	187	253	13.9	88.0	1.1	7.3	25.8	35	35	0.96	75
	460-3-60	414	504	6.4	44.0	0.6	7.3	16.1	20	20	0.96	75
048	208/230-1-60	187	253	23.4	126.0	1.5	7.3	38.1	60	60	0.96	40
	208/230-3-60	187	253	13.0	93.0	1.5	7.3	25.1	35	35	0.96	75
	460-3-60	414	504	6.4	46.5	0.8	7.3	16.3	20	20	0.96	75

1 = Rated in accordance with ARI Standard 110, utilization range "A".    2 = Dual element, time delay type.

ELECTRIC HEAT CORRECTION FACTORS	NOMINAL VOLTAGE	VOLTAGE	KW CAP. MULTIPLIER
	240	208	.75
	480	460	.92

**TABLE 5 - ELECTRICAL DATA (13 SEER HEAT PUMP / ELECTRIC HEAT)**

MODEL BHP	POWER SUPPLY	COMPRESSOR		COND. FAN MOTOR FLA	SUPPLY AIR BLOWER MOTOR, FLA	ELECTRIC HEAT ACCESSORY			MINIMUM CIRCUIT AMPACITY	MAX. FUSE SIZE, ① AMPS	MAX. HACR <sup>②</sup> BREAKER SIZE
		RLA	LRA			MODEL NO.	KW	TOTAL AMPS			
024	208/230-1-60	9.3	57.0	1.1	5.0	2NH04500506	3.8 / 5.0 *	18.1 / 20.8	40.3 / 43.8	45 / 45	45 / 45
						2NH04500706	5.6 / 7.5 *	27.1 / 31.3	51.6 / 56.8	60 / 60	60 / 60
						2NH04501006	7.5 / 10.0 *	36.1 / 41.7	62.9 / 69.8	70 / 70	70 / 70
030	208/230-1-60	15.0	72.5	1.1	5.0	2NH04500506	3.8 / 5.0 *	18.1 / 20.8	47.4 / 50.9	50 / 60	50 / 60
						2NH04500706	5.6 / 7.5 *	27.3 / 31.3	58.7 / 63.9	60 / 70	60 / 70
						2NH04501006	7.5 / 10.0 *	36.1 / 41.7	70.0 / 76.9	70 / 80	70 / 80
036	208/230-1-60	17.2	94.0	1.1	7.3	2NH04501506	11.3 / 15.0 *	54.2 / 62.5	92.6 / 103.0	100 / 110	100 / 110
						2NH04500506	3.8 / 5.0 *	18.1 / 20.8	52.5 / 55.9	60 / 60	60 / 60
						2NH04500706	5.6 / 7.5 *	27.1 / 31.3	63.8 / 69.0	70 / 70	70 / 70
042	208/230-1-60	20.0	104.0	1.1	7.3	2NH04501006	7.5 / 10.0 *	36.1 / 41.7	75.0 / 82.0	80 / 90	80 / 90
						2NP04501506	11.3 / 15.0 *	54.2 / 62.5	97.6 / 108.0	100 / 110	100 / 110
						2NP04501006	7.5 / 10.0 *	36.1 / 41.7	83.2 / 90.1	90 / 90	90 / 90
048	208/230-1-60	23.4	126.0	1.5	7.3	2NP04501506	11.3 / 15.0 *	54.2 / 62.5	105.8 / 116.2	110 / 125	110 / 125
						2NP04502006	15.0 / 20.0 *	72.2 / 83.3	128.3 / 142.2	150 / 150	150 / 150
						2NP04502506	18.8 / 25.0 *	90.3 / 104.2	150.9 / 168.3	175 / 175	175 / 175
030	208/230-3-60	10.0	63.0	1.1	5.0	2NH04501025	7.5 / 10.0 *	20.8 / 24.1	44.7 / 48.7	45 / 50	45 / 50
						2NH04501525	11.3 / 15.0 *	31.3 / 36.1	57.7 / 63.7	60 / 70	60 / 70
						2NH04501025	7.5 / 10.0 *	20.8 / 24.1	48.7 / 52.7	60 / 60	60 / 60
036	208/230-3-60	11.4	78.0	1.1	7.3	2NH04501525	11.3 / 15.0 *	31.3 / 36.1	61.7 / 67.8	70 / 80	70 / 80
						2NP04501025	7.5 / 10.0 *	20.8 / 24.1	51.8 / 55.8	50 / 60	50 / 60
						2NP04501525	11.3 / 15.0 *	31.3 / 36.1	64.9 / 70.9	70 / 70	70 / 70
042	208/230-3-60	13.9	88.0	1.1	7.3	2NP04501025	7.5 / 10.0 *	20.8 / 24.1	51.1 / 55.1	60 / 60	60 / 60
						2NP04501525	11.3 / 15.0 *	31.3 / 36.1	64.1 / 70.2	70 / 80	70 / 80
						2NP04502025	15.0 / 20.0 *	41.7 / 48.1	77.2 / 85.2	80 / 90	80 / 90
048	208/230-3-60	13.0	93.0	1.5	7.3	2NP04502525	18.8 / 25.0 *	52.1 / 60.1	90.2 / 100.2	100 / 100	100 / 100
						2NH04501046	10.0**	12.0	27.5	30	30
						2NH04501546	15.0**	18.0	35.4	40	40
036	460-3-60	5.7	40.0	0.6	7.3	2NH04501046	10.0**	12.0	30.7	35	35
						2NH04501546	15.0**	18.0	38.6	40	40
						2NP04501046	10.0**	12.0	31.6	35	35
042	460-3-60	6.4	44.0	0.6	7.3	2NP04501546	15.0**	18.0	29.4	40	40
						2NP04501046	10.0**	12.0	31.8	35	35
						2NP04501546	15.0**	18.0	39.6	40	40
048	460-3-60	6.4	46.5	0.8	7.3	2NP04502046	20.0**	24.1	47.5	50	50
						2NP04502546	25.0**	30.1	55.3	60	60

① = Dual element, time delay type.

② = Standard circuit breakers may be used in Canada and on applications over 60 amps where the heaters are separately fused.

\* = KW listed is for 240 volts, use table on previous page for 208 or 230 volts.

\*\* = KW listed is for 480 volts, use table on previous page for 460 volts.

**TABLE 6 - SIDE AND BOTTOM SUPPLY AIR BLOWER PERFORMANCE (208/230/460 VOLT<sup>①</sup>)**

MODEL NO. BHP	MOTOR SPEED SETTING	UNIT AIRFLOW	EXTERNAL STATIC PRESSURE - IWG				
			0.15	0.30	0.50	0.70	0.90
			WATTS				
B1HP024	Cooling TB2-A, Heating TB2-A, Electric Heat	800 CFM	91	125	161	206	240
B1HP024	Cooling TB2-B, Heating TB2-B	900 CFM	118	148	199	243	285
B1HP030	Cooling TB2-A, Heating TB2-A, Electric Heat	1000 CFM	280	321	389	449	500
B1HP030	Cooling TB2-B, Heating TB2-B	1125 CFM	356	413	490	557	620
B1HP036	Cooling TB2-A, Heating TB2-A	1050 CFM	209	261	319	372	438
B1HP036	Cooling TB2-B, Heating TB2-B, Electric Heat	1200 CFM	273	324	392	480	541
B1HP042	Electric Heat	1225 CFM	306	341	412	494	577
B1HP042	Cooling TB2-A	1300 CFM	338	395	470	551	640
B1HP042	Cooling TB2-B	1400 CFM	393	466	544	642	734
B1HP042	Heating TB2-A, TB2-B	1500 CFM	500	554	665	752	835
B1HP048	Heating TB2-A	1400 CFM	377	427	504	597	683
B1HP048	Cooling TB2-A	1500 CFM	455	516	601	703	788
B1HP048	Cooling TB2-B, Heating TB2-B, Electric Heat	1600 CFM	530	608	707	800	873

① All units are factory set to TB2-A.

Above data includes allowances for a dry indoor coil and no filters. For additional pressure drops, refer to the "Additional Static Pressure Resistance" table.

**TABLE 7 - ADDITIONAL STATIC PRESSURE RESISTANCE**

DESCRIPTION	RESISTANCE, IWG															
	CFM															
	500	600	700	800	900	1,000	1,100	1,200	1,300	1,400	1,500	1,600	1,700	1,800	1,900	2,000
Wet Indoor coil	0.01	0.01	0.01	0.02	0.01	0.02	0.03	0.04	0.04	0.03	0.04	0.04	0.05	0.05	0.06	0.07
Economizer	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.07	0.08	0.08
Filter/Frame Kit	0.01	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.04	0.05	0.05	0.06	0.06	0.07
Electric Heat	0.02	0.03	0.03	0.03	0.04	0.04	0.05	0.06	0.07	0.08	0.09	0.10	0.01	0.11	0.11	0.12

NOTE: 1. Deduct these resistance values from the available external static pressure shown in the respective Blower Performance Table.

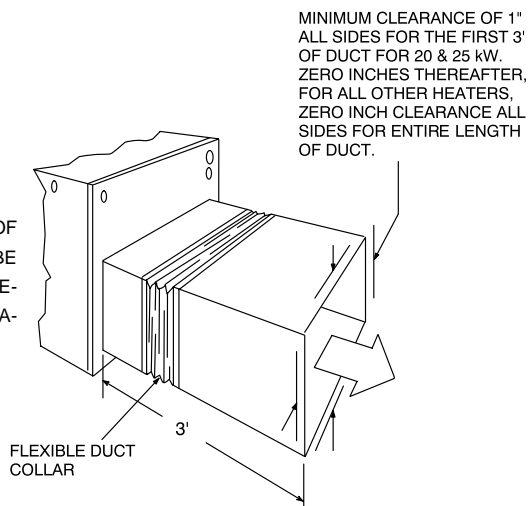
2. The pressure thru the economizer is greater for 100% outdoor air than for 100% return air. If the resistance of the return air duct system is less than 0.25 IWG, the unit will deliver less CFM during full economizer operation.

CLEARANCES (Minimum)	
Front	12"
Back	0"
Left Side (Filter Access)	24"
Right Side	24"
Below Unit <sup>①</sup>	0"
Above Unit <sup>②</sup>	36" (For Condenser Air Discharge)

① Units may be installed on combustible floors made from wood or class A, B or C roof covering material.

② Units must be installed outdoors. Overhanging structures or shrubs should not obstruct outdoor air discharge outlet.

NOTE: FOR UNITS APPLIED WITH A ROOF CURB, THE MINIMUM CLEARANCE MAY BE REDUCED FROM 1 INCH TO 1/2 INCH BETWEEN COMBUSTIBLE ROOF CURB MATERIAL AND THE SUPPLY DUCT.

**FIG. 3 - CLEARANCES**

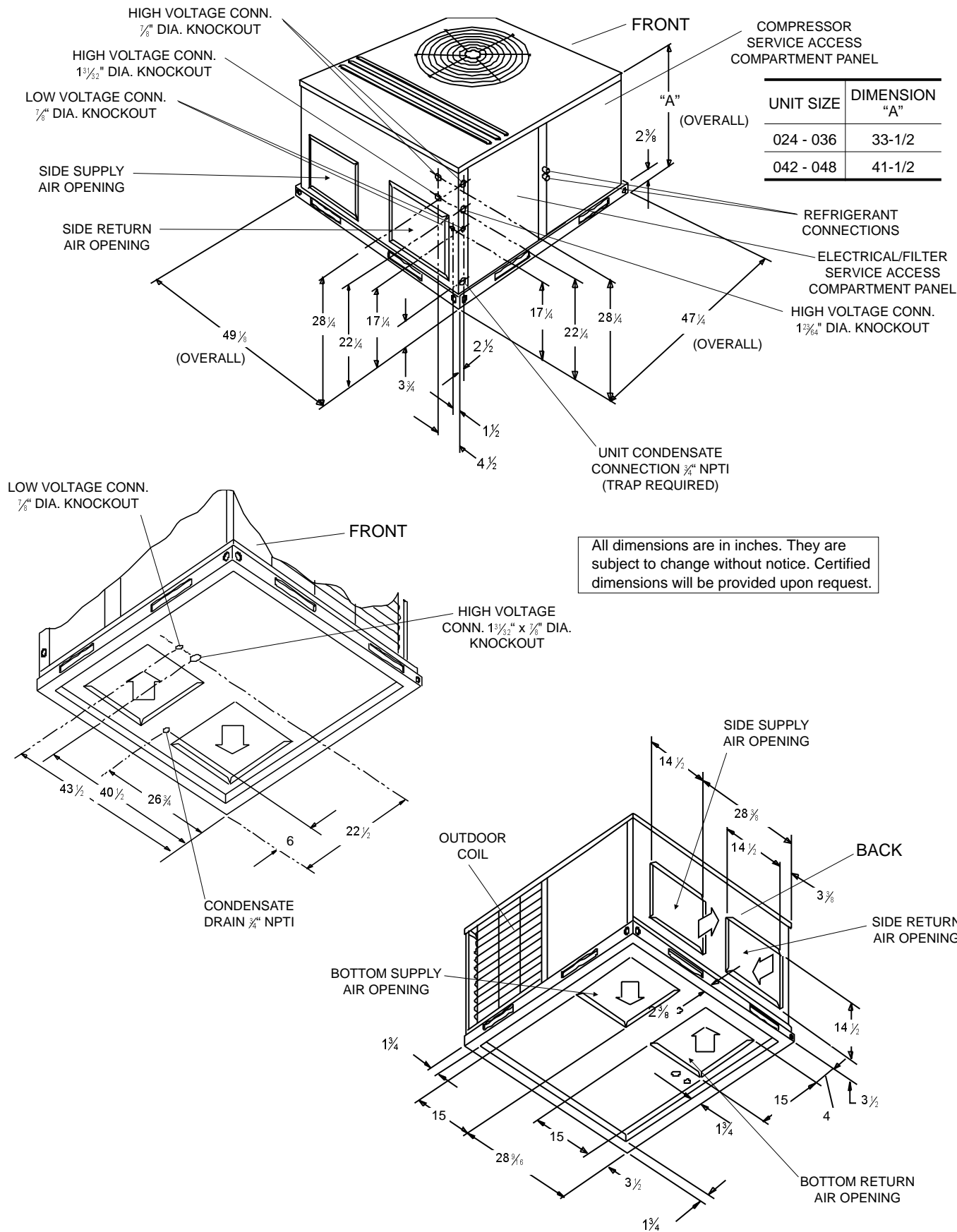


FIG. 4 - DIMENSIONS



## SEQUENCE OF OPERATION

### Anti-short Cycle Timer

This unit has an anti-short cycle timer built in to the defrost control. This timer will not permit the compressor to start within five minutes after the completion of the last cycle or power interruption. To bypass the anti-short cycle feature, short the "TEST" pins together for 2 seconds.

The following sequences of operation are based on using a standard single-stage heat pump thermostat.

### COOLING OPERATION

1. When the fan switch on the thermostat is in the "ON" position, the 24 volts at "G" will bring on the indoor blower motor at the cooling airflow. When the fan switch on the thermostat is in the "AUTO" position, the blower operates only when there is a call for cooling by the thermostat.
2. On a call for cooling, the thermostat sends 24 volts to "Y" and "O" on the fan control and defrost control boards. The reversing valve solenoid is energized, and after the anti-short cycle period is complete contactor coil M1 is energized. Power is supplied to the compressor and outdoor fan motor, and the reversing valve switched to the cooling position. When the fan switch on the thermostat is in the "AUTO" position the indoor blower motor is energized at the cooling airflow.
3. When the demand for cooling has been satisfied, the 24 volt "Y" signal is removed, and the M1 contactor is de-energized. When the fan switch on the thermostat is in the "ON" position, the indoor blower motor continues to run. If the fan switch is in the "AUTO" position, the indoor motor ramps down over a 30-second period.

### HEATING OPERATION

1. When the fan switch on the thermostat is in the "ON" position, the 24 volts at "G" brings on the indoor blower motor at the heating flow. When the fan switch on the thermostat is in the "AUTO" position, the blower operates when there is a call for heating by the thermostat.
2. On a call for heating, the thermostat sends 24 volts to "Y" on the fan control board. After the anti-short cycle period is complete, the 24 volt signal energizes contactor coil M1 and power is supplied to the compressor and outdoor fan motor. The reversing valve remains in the heating position. When the fan switch on the thermostat is in the "AUTO" position, the indoor blower is energized at the heating airflow.
3. For units equipped with supplementary electric heat, when the heat pump cannot meet the demand, the thermostat "W" sends 24 volts to "W2" on the fan control board. This signal also is sent through the defrost control terminals "W" and "W6" and back to the fan control "W1". The 24 volt signal energizes all stages of electric heat.
4. When the heating demand is satisfied, the electric heat is de-energized when the 24 volt "W" signal is removed, and the M1 contactor is de-energized when the 24 volt "Y" signal is removed. When the fan switch on the thermostat is in the "ON" position, the indoor blower continues to run. When the fan switch is in the "AUTO" position, the indoor blower motor ramps down over a 15-second period.

Please refer to Tables 8 and 9 for more information.

**SECURE OWNER'S APPROVAL:** *When the system is functioning 1/6 properly, secure the owner's approval. Show him the location of all disconnect switches and the thermostat. Teach him how to start and stop the unit and how to adjust temperature settings within the limitations of the system.*

### Defrost Operation

The demand defrost control implements a temperature differential ("delta-T") demand defrost algorithm. The heat pump is allowed to operate in the heating mode until the combination of outdoor ambient and outdoor coil temperatures indicate that defrosting is necessary. When coil temperature is below the initiate point for the ambient temperature continuously for 4-1/2 minutes, the heat pump is put into a defrost cycle. This 4-1/2 minute timer eliminates unnecessary defrost cycles caused by refrigeration surges such as those that occur at the start of a heating cycle.

A timed inhibit feature prevents the system from responding to a call for defrost less than 20 minutes after the initiation of the previous defrost. After the 20 minute inhibit time has expired, temperature conditions must call for defrost continuously for 4-1/2 minutes before a defrost cycle is initiated. A temperature inhibit feature prohibits defrost if the coil temperature is above 40°F.

A forced-defrost feature puts the system into a defrost period every 6 hours and 4 minutes to recirculate lubricants, unless the coil temperature is above 40°F. All defrost timing occurs only while the compressor is on.

During the defrost mode, the defrost control will provide a 24 volt signal from terminal "W1/66" to the fan control terminal "W1". This signal will energize electric heat stage 1, if the unit is so equipped.

For trouble shooting purposes, the defrost cycle can be manually initiated by shorting the "TEST" pins together for 5 seconds. Defrost will terminate normally during the "TEST" mode.

### Heat Pump Safety Switch Operation

If the unit is equipped with the field installed upgrade safety package, the refrigeration system will be protected against high or low refrigerant pressure and low indoor coil temperature. If any of these three safety switches opens, the unit will be shut off for the 5 minute anti-short cycle time. Once this has expired, a six hour elapsed run timer begins. If a second opening of a safety switch occurs during this six hour period, the compressor will be locked out.

Resetting the lockout function is accomplished by;

1. Removing power from the control's thermostat 1st stage (Y) input for a time not to exceed 5 seconds (ON-OFF-ON).
2. Removing power from "R" for more than 2 seconds.
3. Shorting the "TEST" pins together for more than 2 seconds.

### Electric Heat Limit Switch Operation

The limit switch responds to over temperature conditions in the air duct. Opening of the device results in dropping power to the relays. The control logic will also respond by turning off the relays. After four limit cycle trips the unit goes into a 1 hour soft lockout period. If during this period the control "sees" another limit cycle, the unit will go into a hard lockout condition. Once in a hard lockout state, the fan is locked on and the heaters are disabled. **Only a power cycle will clear this state.**

During the soft lockout period, the fan responds to thermostat input but the heaters are enabled. This is to sense a failed heater relay. The limit cycle count is reset at the start of a heat request. If the limit remains open for period of 80 seconds or more, the control is immediately put into a hard lockout condition. **Only a power cycle will clear this state.**

**TABLE 8 - THERMOSTAT SIGNALS (SINGLE PHASE UNITS)**

SIGNAL	STATE	BOARD FUNCTION
"G"	ON	FAN INSTANT ON
	OFF	FAN INSTANT OFF
"G" & "Y" & "O"	ON	FAN INSTANT ON COMPRESSOR AND OUTDOOR FAN INSTANT ON (AFTER ANTI-SHORT CYCLE DELAY) REVERSING VALVE ENERGIZED SYSTEM OPERATES IN COOLING
	OFF	COMPRESSOR AND OUTDOOR FAN INSTANT OFF FAN 60 SEC. DELAY OFF
"G" & "Y"	ON	FAN INSTANT ON COMPRESSOR AND OUTDOOR FAN INSTANT ON (AFTER ANTI-SHORT CYCLE DELAY) SYSTEM OPERATES IN HEATING
	OFF	COMPRESSOR AND OUTDOOR FAN INSTANT OFF FAN 60 SEC. DELAY OFF
"G" & "W"	ON	FAN INSTANT ON HEATER BANK 1 ELEC. HEAT INSTANT ON HEATER BANK 2 ELEC. HEAT 10 SEC. DELAY ON HEATER BANK 3 ELEC. HEAT 20 SEC. DELAY ON
	OFF	HEATER BANK 3 ELEC. HEAT INSTANT OFF HEATER BANK 2 ELEC. HEAT ½ SEC. DELAY OFF HEATER BANK 1 ELEC. HEAT 1 SEC. DELAY OFF FAN 10 SEC. DELAY OFF
"G" & "Y" & "W"	ON	FAN INSTANT ON COMPRESSOR AND OUTDOOR FAN INSTANT ON SYSTEM OPERATES IN HEATING HEATER BANK 1 ELEC. HEAT INSTANT ON HEATER BANK 2 ELEC. HEAT 10 SEC. DELAY ON HEATER BANK 3 ELEC. HEAT 20 SEC. DELAY ON
	OFF	COMPRESSOR AND OUTDOOR FAN INSTANT OFF HEATER BANK 3 ELEC. HEAT INSTANT OFF HEATER BANK 2 ELEC. HEAT ½ SEC. DELAY OFF HEATER BANK 1 ELEC. HEAT 1 SEC. DELAY OFF FAN 60 SEC. DELAY OFF
"W"	ON	FAN INSTANT ON HEATER BANK 1 ELEC. HEAT INSTANT ON HEATER BANK 2 ELEC. HEAT 10 SEC. DELAY ON HEATER BANK 3 ELEC. HEAT 20 SEC. DELAY ON
	OFF	HEATER BANK 3 ELEC. HEAT INSTANT OFF HEATER BANK 2 ELEC. HEAT ½ SEC. DELAY OFF HEATER BANK 1 ELEC. HEAT 1 SEC. DELAY OFF FAN 10 SEC. DELAY OFF

**TABLE 9 - THERMOSTAT SIGNALS (THREE PHASE UNITS)**

SIGNAL	STATE	BOARD FUNCTION
"G"	ON	FAN INSTANT ON
	OFF	FAN INSTANT OFF
"G" & "Y" & "O"	ON	FAN INSTANT ON COMPRESSOR AND OUTDOOR FAN INSTANT ON (AFTER ANTI-SHORT CYCLE DELAY) REVERSING VALVE ENERGIZED SYSTEM OPERATES IN COOLING
	OFF	COMPRESSOR AND OUTDOOR FAN INSTANT OFF FAN 60 SEC. DELAY OFF
"G" & "Y"	ON	FAN INSTANT ON COMPRESSOR AND OUTDOOR FAN INSTANT ON (AFTER ANTI-SHORT CYCLE DELAY) SYSTEM OPERATES IN HEATING
	OFF	COMPRESSOR AND OUTDOOR FAN INSTANT OFF FAN 60 SEC. DELAY OFF
"G" & "W"	ON	FAN INSTANT ON HEATER BANK 1, 2 & 3 ELEC. HEAT INSTANT ON HEATER BANK 4, 5 & 6 ELEC. HEAT 10 SEC. DELAY ON
	OFF	HEATER BANK 4, 5 & 6 ELEC. HEAT INSTANT OFF HEATER BANK 1, 2 & 3 ELEC. HEAT ½ SEC. DELAY OFF FAN 10 SEC. DELAY OFF
"G" & "Y" & "W"	ON	FAN INSTANT ON COMPRESSOR AND OUTDOOR FAN INSTANT ON SYSTEM OPERATES IN HEATING HEATER BANK 1, 2 & 3 ELEC. HEAT INSTANT ON HEATER BANK 4, 5 & 6 ELEC. HEAT 10 SEC. DELAY ON
	OFF	COMPRESSOR AND OUTDOOR FAN INSTANT OFF HEATER BANK 4, 5 & 6 ELEC. HEAT INSTANT OFF HEATER BANK 1, 2 & 3 ELEC. HEAT ½ SEC. DELAY OFF FAN 60 SEC. DELAY OFF
"W"	ON	FAN INSTANT ON HEATER BANK 1, 2 & 3 ELEC. HEAT INSTANT ON HEATER BANK 4, 5 & 6 ELEC. HEAT 10 SEC. DELAY ON
	OFF	HEATER BANK 4, 5 & 6 ELEC. HEAT INSTANT OFF HEATER BANK 1, 2 & 3 ELEC. HEAT ½ SEC. DELAY OFF FAN 10 SEC. DELAY OFF

## MAINTENANCE

### NORMAL MAINTENANCE

**WARNING:** *Prior to any of the following maintenance procedures, shut off all power to the unit, to avoid personal injury.*

Periodic maintenance consists of changing or cleaning filters and general cleaning of the outdoor coil.

**FILTERS** - Inspect once a month. Replace Disposable or clean Permanent Type as necessary. DO NOT replace Permanent Type with Disposable.

**MOTORS** - Indoor and outdoor fan motors are permanently lubricated and require no maintenance.

**OUTDOOR COIL** - Dirt should not be allowed to accumulate on the outdoor coil surface or other parts in the air circuit. Cleaning should be as often as necessary to keep the coil clean. Use a brush, vacuum cleaner attachment, or other suitable means. If water is used to clean the coil, be sure that the power to the unit is shut off prior to cleaning.

**CAUTION:** *Exercise care when cleaning the coil so that the coil fins are not damaged.*

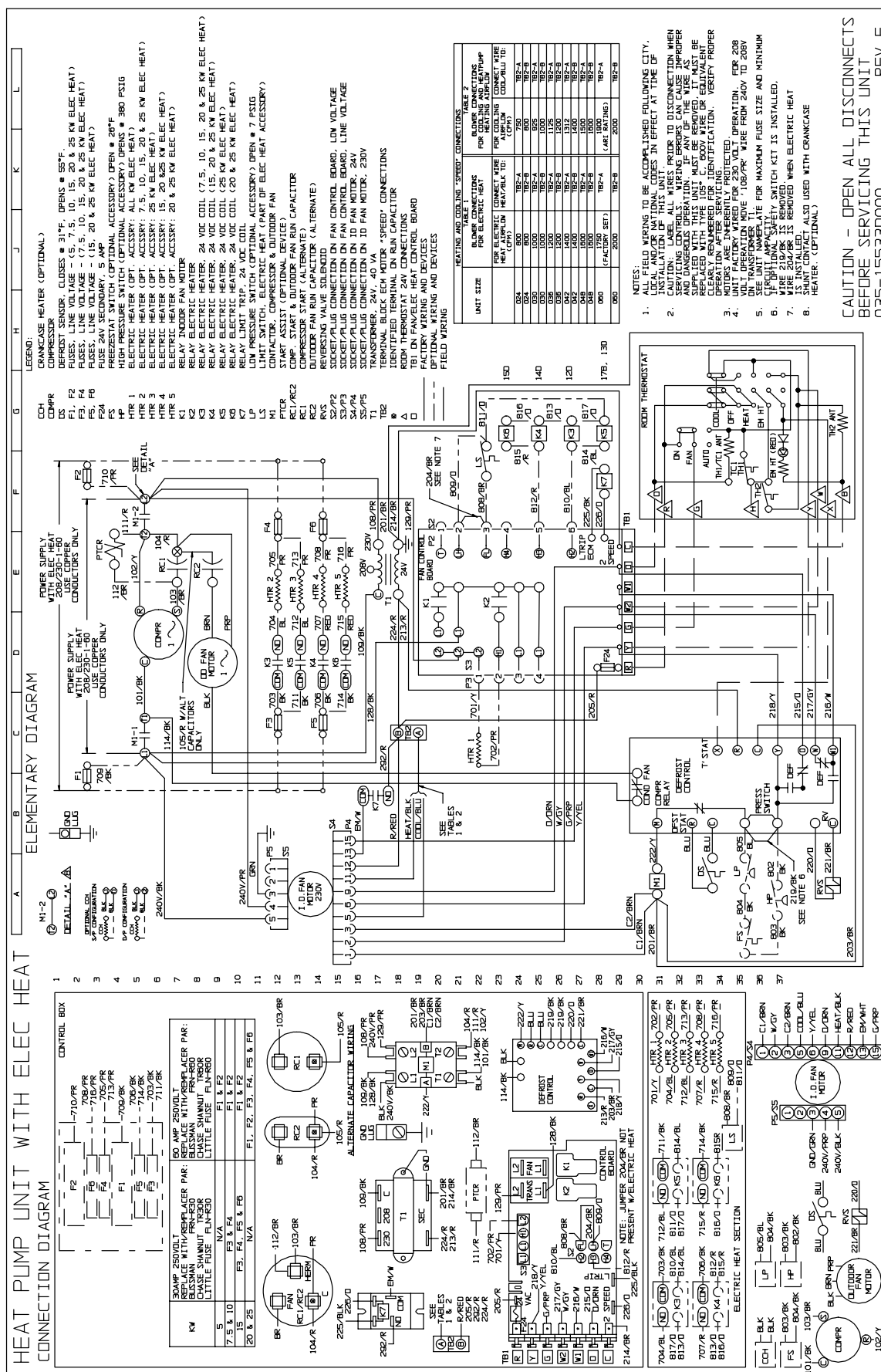
*Do not permit the hot condenser air discharge to be obstructed by overhanging structures or shrubs.*

## TROUBLESHOOTING

**WARNING:** *Troubleshooting of components necessarily requires opening the electrical control box with the power connected to the unit. Use extreme care when working with live circuit! Check the unit nameplate for the correct range before making any connections with line terminals.*

**CAUTION:** *The wire number or color and terminal designations referred to may vary. Check the wiring label inside the control box access panel for the correct wiring.*

**CAUTION:** *If the variable speed motor found in the B1HP models operates erratically, check the fan control board for the presence of a break-off tab. Remove tab if present.*

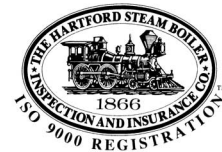


**FIG. 5 - TYPICAL WIRING DIAGRAM BHP MODELS- 208/230-1-60 POWER SUPPLY**





**FIG. 7 - TYPICAL WIRING DIAGRAM BHP - 460-3-60 POWER SUPPLY**



This product was manufactured  
in a plant whose quality system  
is certified/registered as being  
in conformity with ISO 9001.



Heating and Air Conditioning

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